

C L A I M S

1. A methodology for determining the alertness of a driver of a motor vehicle comprising:

sensing at least one first movement characteristic of at least a first part of a motor vehicle;

sensing at least one second movement characteristic of at least a second part of said motor vehicle;

employing at least one time relationship between said at least one first movement characteristic and said at least one second movement characteristic in order to sense and to distinguish between driver initiated movements and non-driver initiated movements; and

determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.

2. A methodology according to claim 1 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

3. A methodology according to claim 1 and wherein said at least one first movement characteristic and said at least one second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

4. A methodology according to claim 1 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

5. A methodology according to claim 1 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

6. A methodology according to claim 3 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

7. A methodology according to claim 6 and wherein said first location is at a steering wheel forming part of said steering assembly.

8. A methodology according to claim 2 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

9. A methodology according to claim 3 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

10. A methodology according to claim 4 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

11. A methodology according to claim 5 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

12. A methodology according to claim 6 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.
13. A methodology for determining the alertness of a driver of a motor vehicle comprising:
employing at least one time relationship between at least one first movement characteristic of at least a first part of a motor vehicle and at least one second movement characteristic of at least a second part of said motor vehicle in order to sense and to distinguish between driver initiated movements and non-driver initiated movements; and
determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.
14. A methodology according to claim 13 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.
15. A methodology according to claim 13 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.
16. A methodology according to claim 13 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.
17. A methodology according to claim 13 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and

said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

18. A methodology according to claim 15 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

19. A methodology according to claim 18 and wherein said first location is at a steering wheel forming part of said steering assembly.

20. A methodology according to claim 14 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

21. A methodology according to claim 15 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

22. A methodology according to claim 16 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

23. A methodology according to claim 17 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

24. A methodology according to claim 18 and wherein:
said at least one first movement characteristic is displacement; and

said at least one second movement characteristic is displacement.

25. A methodology for determining the alertness of a driver of a motor vehicle comprising:

sensing at least one first movement characteristic of at least a first part of a motor vehicle;

sensing at least one second movement characteristic of at least a second part of a motor vehicle; and

employing said at least one first movement characteristic and said at least one second movement characteristic in order to determine the alertness of said driver of said motor vehicle.

26. A methodology according to claim 25 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

27. A methodology according to claim 25 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

28. A methodology according to claim 25 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

29. A methodology according to claim 25 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

30. A methodology according to claim 27 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

31. A methodology according to claim 30 and wherein said first location is at a steering wheel forming part of said steering assembly.

32. A methodology according to claim 26 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

33. A methodology according to claim 27 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

34. A methodology according to claim 28 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

35. A methodology according to claim 29 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

36. A methodology according to claim 30 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

37. A methodology for determining the alertness of a driver of a

motor vehicle comprising:

sensing at least one first movement characteristic of at least a first part of a motor vehicle;

sensing at least one second movement characteristic of at least a second part of said motor vehicle;

employing said at least one first movement characteristic and said at least one second movement characteristic in order to sense driver initiated movements; and

determining the alertness of said driver of said motor vehicle based at least partially on said sensed driver initiated movements.

38. A methodology according to claim 37 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

39. A methodology according to claim 37 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

40. A methodology according to claim 37 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

41. A methodology according to claim 37 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

42. A methodology according to claim 39 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power

steering unit forming part of said steering assembly.

43. A methodology according to claim 42 and wherein said first location is at a steering wheel forming part of said steering assembly.

44. A methodology according to claim 38 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

45. A methodology according to claim 39 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

46. A methodology according to claim 40 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

47. A methodology according to claim 41 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

48. A methodology according to claim 42 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

49. A methodology for determining the alertness of a driver of a motor vehicle comprising:
sensing at least one characteristic of driver initiated movements of at

least one part of a motor vehicle;

sensing at least one characteristic of non-driver initiated movements of at least one part of a motor vehicle; and

determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.

50. A methodology according to claim 49 and wherein said at least one characteristic of driver initiated movements is extent.

51. A methodology according to claim 49 and wherein said at least one characteristics of non-driver initiated movements is extent.

52. A methodology according to claim 50 and wherein said at least one characteristics of non-driver initiated movements is extent.

53. A methodology according to claim 50 and wherein extent of driver initiated movements includes at least one of:

the integrated magnitude of the driver initiated movements;

the RMS average of the magnitude of the driver initiated movements;

the number of peaks of the driver initiated movements per unit time.

54. A methodology according to claim 51 and wherein extent of non-driver initiated movements includes at least one of:

the integrated magnitude of the non-driver initiated movements;

the RMS average of the magnitude of the non-driver initiated movements;

the number of peaks of the non-driver initiated movements per unit time.

55. A methodology according to claim 49 and wherein said sensing at least one characteristic of driver initiated movements of at least one part of a motor vehicle and said sensing at least one characteristic of non-driver initiated movements of at least

one part of a motor vehicle comprise sensing at least one first movement characteristic and sensing at least one second movement characteristic of said motor vehicle.

56. A methodology according to claim 55 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

57. A methodology according to claim 56 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

58. A methodology according to claim 56 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

59. A methodology according to claim 56 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

60. A methodology according to claim 57 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

61. A methodology according to claim 60 and wherein said first location is at a steering wheel forming part of said steering assembly.

62. A methodology according to claim 60 and wherein:
said at least one first movement characteristic is angular displacement of

said steering wheel; and

said at least one second movement characteristic is a steering angle of at least one road wheel.

63. A methodology according to claim 57 and wherein:

said at least one first movement characteristic is displacement; and

said at least one second movement characteristic is displacement.

64. A methodology according to claim 58 and wherein:

said at least one first movement characteristic is displacement; and

said at least one second movement characteristic is acceleration in at least one direction.

65. A methodology according to claim 59 and wherein:

said at least one first movement characteristic is displacement; and

said at least one second movement characteristic is acceleration in at least one direction.

66. A methodology according to claim 60 and wherein:

said at least one first movement characteristic is displacement; and

said at least one second movement characteristic is displacement.

67. A methodology according to claim 1 and wherein said determining also employs the speed of the vehicle.

68. A methodology according to claim 13 and wherein said determining also employs the speed of the vehicle.

69. A methodology according to claim 25 and wherein said determining also employs the speed of the vehicle.

70. A methodology according to claim 37 and wherein said determining also employs the speed of the vehicle.

71. A system for determining the alertness of a driver of a motor vehicle comprising:

a first sensor sensing at least one first movement characteristic of at least a first part of a motor vehicle;

a second sensor sensing at least one second movement characteristic of at least a second part of said motor vehicle;

a distinguisher, employing at least one time relationship between said at least one first movement characteristic and said at least one second movement characteristic in order to sense and to distinguish between driver initiated movements and non-driver initiated movements; and

an alertness determiner, determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.

72. A system according to claim 71 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

73. A system according to claim 71 and wherein said at least one first movement characteristic and said at least one second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

74. A system according to claim 71 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

75. A system according to claim 71 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

76. A system according to claim 73 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

77. A system according to claim 76 and wherein said first location is at a steering wheel forming part of said steering assembly.

78. A system according to claim 72 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

79. A system according to claim 73 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

80. A system according to claim 74 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

81. A system according to claim 75 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

82. A system according to claim 76 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.
83. A system for determining the alertness of a driver of a motor vehicle comprising:
a distinguisher, employing at least one time relationship between at least one first movement characteristic of at least a first part of a motor vehicle and at least one second movement characteristic of at least a second part of said motor vehicle in order to sense and to distinguish between driver initiated movements and non-driver initiated movements; and
an alertness determiner, determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.
84. A system according to claim 83 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.
85. A system according to claim 83 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.
86. A system according to claim 83 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

87. A system according to claim 83 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

88. A system according to claim 85 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

89. A system according to claim 88 and wherein said first location is at a steering wheel forming part of said steering assembly.

90. A system according to claim 84 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

91. A system according to claim 85 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

92. A system according to claim 86 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

93. A system according to claim 87 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

94. A system according to claim 88 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.
95. A system for determining the alertness of a driver of a motor vehicle comprising:
a first sensor, sensing at least one first movement characteristic of at least a first part of a motor vehicle;
a second sensor, sensing at least one second movement characteristic of at least a second part of a motor vehicle; and
a distinguisher, employing said at least one first movement characteristic and said at least one second movement characteristic in order to determine the alertness of said driver of said motor vehicle.
96. A system according to claim 95 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.
97. A system according to claim 95 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.
98. A system according to claim 95 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.
99. A system according to claim 95 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement

characteristic.

100. A system according to claim 97 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

101. A system according to claim 100 and wherein said first location is at a steering wheel forming part of said steering assembly.

102. A system according to claim 96 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

103. A system according to claim 97 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

104. A system according to claim 98 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

105. A system according to claim 99 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

106. A system according to claim 100 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

107. A system for determining the alertness of a driver of a motor vehicle comprising:

a first sensor, sensing at least one first movement characteristic of at least a first part of a motor vehicle;

a second sensor, sensing at least one second movement characteristic of at least a second part of said motor vehicle;

a distinguisher, employing said at least one first movement characteristic and said at least one second movement characteristic in order to sense driver initiated movements; and

an alertness determiner, determining the alertness of said driver of said motor vehicle based at least partially on said sensed driver initiated movements.

108. A system according to claim 107 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

109. A system according to claim 107 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

110. A system according to claim 107 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

111. A system according to claim 107 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

112. A system according to claim 109 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

113. A system according to claim 112 and wherein said first location is at a steering wheel forming part of said steering assembly.

114. A system according to claim 108 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

115. A system according to claim 109 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

116. A system according to claim 110 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

117. A system according to claim 111 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

118. A system according to claim 112 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

119. A system for determining the alertness of a driver of a motor vehicle comprising:

a driver initiated movement sensor, sensing at least one characteristic of driver initiated movements of at least one part of a motor vehicle;

a non-driver initiated movement sensor, sensing at least one characteristic of non-driver initiated movements of at least one part of a motor vehicle; and

a determiner, determining the alertness of said driver of said motor vehicle based on at least one relationship between said driver initiated movements and said non-driver initiated movements.

120. A system according to claim 119 and wherein said at least one characteristic of driver initiated movements is extent.

121. A system according to claim 119 and wherein said at least one characteristics of non-driver initiated movements is extent.

122. A system according to claim 120 and wherein said at least one characteristics of non-driver initiated movements is extent.

123. A system according to claim 120 and wherein extent of driver initiated movements includes at least one of:

the integrated magnitude of the driver initiated movements;

the RMS average of the magnitude of the driver initiated movements;

the number of peaks of the driver initiated movements per unit time.

124. A system according to claim 121 and wherein extent of non-driver initiated movements includes at least one of:

the integrated magnitude of the non-driver initiated movements;

the RMS average of the magnitude of the non-driver initiated movements;

the number of peaks of the non-driver initiated movements per unit time.

125. A system according to claim 119 and wherein said driver initiated movement sensor sensing at least one characteristic of driver initiated movements of at least one part of a motor vehicle and said non-driver initiated movement sensor sensing at least one characteristic of non-driver initiated movements of at least one part of a motor vehicle comprise a first sensor, sensing at least one first movement characteristic and a second sensor sensing at least one second movement characteristic of said motor vehicle.

126. A system according to claim 125 and wherein said at least one first movement characteristic comprises a steering wheel movement characteristic and said at least one second movement characteristic comprises a road wheel movement characteristic.

127. A system according to claim 126 and wherein said at least one first movement characteristic and the second movement characteristic comprise movement characteristics of first and second locations along a steering assembly extending from a steering wheel to at least one road wheel of said motor vehicle.

128. A system according to claim 126 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle body movement characteristic.

129. A system according to claim 126 and wherein said at least one first movement characteristic comprises a steering assembly movement characteristic and said at least one second movement characteristic comprises a vehicle chassis movement characteristic.

130. A system according to claim 127 and wherein said first and second locations are located respectively at or upstream of and at or downstream of a power steering unit forming part of said steering assembly.

131. A system according to claim 130 and wherein said first location is at a steering wheel forming part of said steering assembly.

132. A system according to claim 130 and wherein:
said at least one first movement characteristic is angular displacement of said steering wheel; and
said at least one second movement characteristic is a steering angle of at least one road wheel.

133. A system according to claim 127 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

134. A system according to claim 128 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

135. A system according to claim 129 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is acceleration in at least one direction.

136. A system according to claim 130 and wherein:
said at least one first movement characteristic is displacement; and
said at least one second movement characteristic is displacement.

137. A system according to claim 78 and wherein said determining also employs the speed of the vehicle.

138. A system according to claim 83 and wherein said determining also

employs the speed of the vehicle.

139. A system according to claim 95 and wherein said determining also employs the speed of the vehicle.

140. A system according to claim 107 and wherein said determining also employs the speed of the vehicle.

141. A system according to claim 71 and also comprising a driver alertness alarm, responsive to an alarm from said driver alertness determiner for providing an alarm to a driver deemed not to be sufficiently alert.

142. A system according to claim 83 and also comprising a driver alertness alarm, responsive to an alarm from said driver alertness determiner for providing an alarm to a driver deemed not to be sufficiently alert.

143. A system according to claim 95 and also comprising a driver alertness alarm, responsive to an alarm from said driver alertness determiner for providing an alarm to a driver deemed not to be sufficiently alert.

144. A system according to claim 107 and also comprising a driver alertness alarm, responsive to an alarm from said driver alertness determiner for providing an alarm to a driver deemed not to be sufficiently alert.

145. A system according to claim 119 and also comprising a driver alertness alarm, responsive to an alarm from said driver alertness determiner for providing an alarm to a driver deemed not to be sufficiently alert.